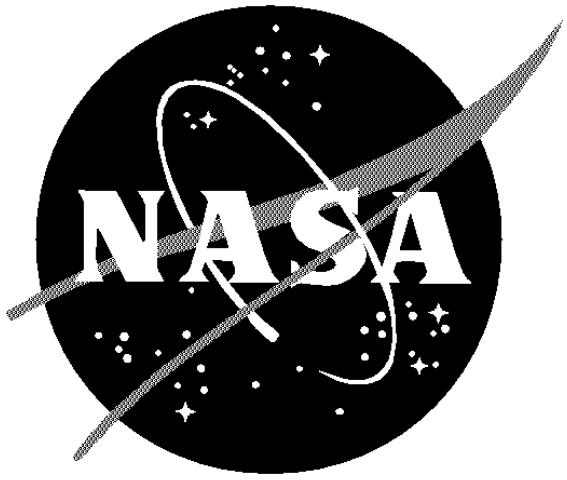

National Aeronautics and Space Administration

March 20, 1998

NRA-98-OES-04

RESEARCH ANNOUNCEMENT

ATMOSPHERIC CHEMISTRY MODELING AND ANALYSIS PROGRAM
and
STRATOSPHERIC AEROSOL AND GAS EXPERIMENT (SAGE II)
SCIENCE TEAM

Letters of Intent Due April 24, 1998 (4:30 PM EDT)

Proposals June 19, 1998 (4:30 PM EDT)

OMB Approval No. 2700-0087

ATMOSPHERIC CHEMISTRY MODELING AND ANALYSIS PROGRAM

NASA Research Announcement
Soliciting Research Proposals
for
Period Ending
June 19, 1998

NRA 98-OES-04
Issued March 20, 1998

Office of Earth Science
National Aeronautics and Space Administration
Washington, DC 20546

RESEARCH ANNOUNCEMENT FOR THE ATMOSPHERIC CHEMISTRY MODELING AND ANALYSIS PROGRAM AND STRATOSPHERIC AEROSOL AND GAS EXPERIMENT (SAGE II) SCIENCE TEAM

This NASA Research Announcement (NRA) solicits research proposals for science investigations to be carried out under the Atmospheric Chemistry Modeling and Analysis Program (ACMAP) of the Science Division of NASA's Office of Earth Science (OES) and for a newly reconstituted science team set up for the second Stratospheric Aerosol and Gas Experiment (SAGE) satellite instruments. ACMAP supports research in computational modeling and data analysis for studies on the trace constituent distributions of the troposphere and stratosphere, as well as dynamical properties of the stratosphere. A fuller description of ACMAP is found in Appendix A of this NRA. SAGE is an instrument designed to measure the vertical profile of ozone, nitrogen dioxide, water vapor, and aerosols in the stratosphere. The SAGE II instrument flies aboard the Earth Radiation Budget Satellite (ERBS), launched in October, 1984. Additional instruments in the SAGE series included the first SAGE (SAGE I), which flew aboard the AEM-2 spacecraft and obtained data from 1979-1981, and the third SAGE (SAGE III), which is scheduled for launch in 1999 and 2002 aboard a Russian Meteor-3M satellite and the International Space Station, respectively. Team membership for SAGE III was established in response to an Announcement of Opportunity (AO) issued by NASA and is not being competed at this time. A fuller description of the SAGE instrument and science is found in Appendix A of this announcement.

ACMAP supports approximately 70 investigators, and had a budget of $6.5 million in FY98. In order to support enhanced modeling of tropospheric chemistry and improved analysis of in situ trace constituent measurements in the troposphere, plans exist to augment the ACMAP budget by approximately $0.5 million per year beginning FY97. Budget uncertainties may reduce the amount of or eliminate this increase in FY99, however.

This solicitation is to encourage the submission of proposals (a) for new tasks within ACMAP, emphasizing the desired increase in focus on tropospheric chemistry and (b) for membership on the SAGE II Science Team, which will be reconstituted following the selection of proposals submitted in response to this NRA. Appendix A also describes in additional detail the science questions for which ACMAP proposals are most desired. Proposals for other areas within ACMAP may be submitted in response to this NRA, although little growth in funding is anticipated for them. Existing grants, contracts, and interagency agreements already funded within ACMAP that expire at the end of FY98 or during FY99 must also be submitted in response to this NRA to ensure the possibility of continuation beyond the currently planned expiration of funding. Areas of greatest interest for the SAGE II Science Team are outlined in Appendix A.

This NRA solicits two classes of proposals. The first is the standard three-year ACMAP research proposal, which may relate to any of the areas of ACMAP science as described in Appendix A (not just the areas of greatest interest for new or redirected existing tasks). It is expected that somewhere between 10 and 20 ACMAP tasks of size varying from approximately $35,000 to $275,000 per year will be selected in response to this NRA (note these totals include both new proposals and renewals of currently-funded proposals). Most ACMAP tasks are in the $75,000 to $150,000 per year range, with larger tasks typically being restricted to computationally-intensive modeling tasks which actively support internationally-organized assessment activities. ACMAP funding is available only to modeling and data analysis tasks. **Funding for laboratory or field measurements will not be provided under ACMAP**, and any experimental or field measurement proposals submitted as ACMAP proposals will be returned as non-responsive.

The second class of proposals is for the SAGE II Science Team being reconstituted with this announcement. The budget available for SAGE II Science Team proposals being selected in response to this announcement is approximately $1 million per year. It is expected that some 10-15 SAGE II tasks of size varying from approximately $40,000 to $100,000 per year will be selected in response to this NRA. As detailed in Appendix A, investigations to be supported under the SAGE II Science Team include not only data analysis and interpretation, but also correlative measurements/validation and algorithm studies. Since SAGE II measures aerosols and clouds in addition to trace constituents, the SAGE II Science Team is expected to include investigators working in areas of atmospheric radiation, cloud studies, and atmospheric chemistry.

Because of the similarity in scientific objectives relative to analysis and interpretation of SAGE II data, SAGE II Science Team membership may be conferred on some investigators whose proposals are selected as part of the ACMAP part of the solicitation. Investigators may request that proposals be considered in both the ACMAP and SAGE categories; it is quite likely that some tasks may receive joint funding from the ACMAP and SAGE programs.

Proposals may be submitted at any time during the period ending June 19, 1998, but not later than 4:30 p.m., e.d.t. on June 19, 1998. Proposals received after that date will be handled in accordance with NASA policy concerning late proposals (NFS 1815.412). Proposals will be peer reviewed by approximately November 15, 1998. If accepted, they will be integrated into the FY99 research program beginning approximately January 1, 1999.

Participation in ACMAP and SAGE is open to all categories of organizations: educational institutions, industry, non-profit institutions, NASA centers, other US Government agencies, and international educational institutions, industries, and government agencies.

Funds are not presently available for awards under this NRA. The Government's obligation to make awards is contingent upon the availability of appropriated funds from which payment for award purposes can be made and the receipt of proposals which the Government determines are acceptable for award under this NRA.

Appendix A provides technical and programmatic information concerning the scope, foci, and objectives of the scientific activities covered by this Announcement, as well as specific instructions for proposers to this NRA. Appendix B contains the basic guidance needed for preparation of proposals in response to an NRA. Appendix C provides guidance for foreign participation. Appendix D includes required certifications and proposal cover sheet, which must be completed and returned to NASA with any proposal submitted in response to this NRA.

All prospective proposers to this announcement are strongly encouraged to submit a letter of intent no later than 4:30 PM on Friday, April 24, 1998. This will allow us to organize our peer review staff to adequately support the proposal review process. This letter of intent is available electronically via the Internet at URL http://www.mtpe.hq.nasa.gov/LOI/form.html. The URL for co-investigator information is http:///www.mtpe.hq.nasa.gov/LOI/coi.html. It is requested that these electronic letter of intent forms be used by all prospective proposers, although those lacking access to the Internet may submit a letter by fax to (202) 554-3024 with the following information:

- PI and CoI names and addresses (including Zip + 4)
- Title of proposal

• Contact information (phone and fax numbers and electronic mail address) for PI
• A brief summary of the proposed research (Please limit this to no more than 3000 characters)

Identifier: NRA 98-OES-04

Submit Letters of Intent and Proposals to:

ACMAP/SAGE NRA
Code Y
400 Virginia Avenue SW, Suite 700
Washington, DC 20024

For overnight mail delivery purposes only the recipient telephone number is (202) 554-2775.

Copies Required: 10

Selecting Official: Director, Science Division

Obtain Additional Information From:
Dr. Jack A. Kaye
ACMAP Manager/SAGE II Program Scientist
NASA Headquarters, Code YS
Washington, DC 20546
Tel.: (202) 358-0757
Fax: (202) 358-2770
e-mail: Jack.Kaye@hq.nasa.gov

Additional information on the SAGE II instrument, archived data sets, and data availability may be obtained from the SAGE II Project Scientist:

Dr. L. R. Poole
SAGE II Project Scientist
NASA Langley Research Center, Code 475
Hampton, VA 23681-0001
Tel: (757) 864-2689
Fax: (757) 864-2671
e-mail: l.r.poole@larc.nasa.gov

Your interest and cooperation in participating in this opportunity are appreciated.

Ghassem Asrar
Associate Administrator
Office of Earth Science

Enclosures:

Appendix A, "Technical Description and Specific Guidelines for Proposers to this Announcement"

Appendix B, "Instructions for Responding to NASA Research Announcements"

Appendix C, "Guidelines for Foreign Proposals"

Appendix D, "Required Certifications and Cover Sheet"

APPENDIX A:

TECHNICAL DESCRIPTION AND SPECIFIC GUIDELINES FOR PROPOSERS TO THIS ANNOUNCEMENT

Atmospheric Chemistry Modeling and Analysis Program (ACMAP)

The primary objective of ACMAP is to study the distribution of trace constituents in the global troposphere and stratosphere through the use of computational models and the analysis of spatially and temporally extended data sets. ACMAP also supports the bulk of NASA's studies of stratospheric meteorology, and of the dynamical, chemical, and radiative couplings between the Earth's stratosphere and troposphere as well as the stratosphere and upper atmosphere (mesosphere/thermosphere). Efforts within ACMAP emphasize the global atmosphere, although some consideration is given to the large regional (continental and hemispheric) scales; ACMAP does not support studies at local scales. ACMAP only supports proposals in the areas of data analysis, interpretation, and modeling. **ACMAP does not support proposals for laboratory work or field measurements**.

Current research in ACMAP may be thought of as being broken down into several categories. A listing of these categories, together with brief descriptions and their approximate fraction of ACMAP in FY97 follow:

• **Stratospheric Dynamics and Related Data Analysis (20%)**: Modeling and data analysis studies of temperature and wind distributions of the stratosphere, transport processes in the stratosphere, and their long-term evolution, as well as dynamical couplings between the stratosphere and regions below (troposphere) and above (mesosphere).

• **Atmospheric Chemistry Data Analysis (30%)**: Analysis of satellite and aircraft data on the trace constituent composition of the troposphere and stratosphere, including both short- and long-term variations, as well as re-examination of existing data sets. Data sets of greatest interest are NASA satellite missions and atmospherically-oriented aircraft missions (the stratospherically oriented AAOE, AASE I, AASE II, SPADE, ASHOE/MAESA, STRAT, VOTE/TOTE, and the tropospherically-oriented Global Troposphere Experiment series of campaigns).

• **Aerosols, Stratospheric Clouds, and Radiation (10%)**: Studies of the processes by which aerosols and polar stratospheric clouds form in the atmosphere and of the optical and chemical effects they have on radiative transfer in the troposphere-stratosphere system, including ultraviolet radiation at the Earth's surface

• **Multi-Dimensional Atmospheric Modeling (35%)**: Studies of tropospheric and stratospheric chemistry using two- and three-dimensional models, emphasizing the simulation of the combined effects of chemical and transport properties on atmospheric chemistry; evaluation of models using ground-, aircraft-, and space-based data forms an important part of these efforts. Increasing emphasis has been placed recently in the improved representation of the chemical effects of aerosols on tropospheric trace constituents. Some consideration is given to the combined effects of atmospheric chemistry and climate change.

The remaining part of ACMAP (~5%) goes towards program infrastructure, meetings, student support, and general support of activities which enhance the research effectiveness of principal investigators (PIs) within the program.

ACMAP is only one of several NASA programs supporting modeling and analysis of atmospheric trace constituent measurements. Other NASA programs active in this area include the Interdisciplinary Science Program of the Earth Observing System (EOS), the Upper Atmosphere Research Satellite (UARS) Guest Investigator Program, the Total Ozone Mapping Spectrometer (TOMS) Science Team, and the Atmospheric Effects of Aviation Project (AEAP) of NASA's Office of Aeronautics and Space Transportation Technology. Some modeling activities are also carried out under the Upper Atmosphere Research Program and the Tropospheric Chemistry Program of OES. The two- and three-dimensional modeling efforts supported by ACMAP contribute to a broader NASA effort in atmospheric chemistry modeling, the Global Modeling Initiative, primarily funded by AEAP.

The full range of NASA's research in the area of atmospheric ozone, including plans for future evolution of this research, is described in the Atmospheric Ozone section of the *Mission to Planet Earth Science Research Plan*. This document is available electronically at http://www.hq.nasa.gov/office/mtpe/draftsciplan/mtpe-srp.htm. The broader context of NASA's Earth Science Enterprise program may be found in the *Mission to Planet Earth Strategic Enterprise Plan*, which is available at http://www.hq.nasa.gov/office/mtpe/stratplan/stratplan.html.

The intention is to maintain support within ACMAP for each of the above areas, and submission of new or renewal proposals in any of them is invited.
The new tasks selected in response to this announcement should help increase the relative proportion of tropospherically-oriented tasks within ACMAP.

The research areas for which new and/or redirected renewal proposals are most desired are as follows:

• The application of atmospheric chemistry models to studies of the biogeochemical cycles of chemically and radiative active trace constituents in the troposphere-stratosphere system, including constituents such as methane, nitrous oxide, naturally-occurring sulfur-containing species, and halogenated hydrocarbons. Proposals may include a significant focus on the production/emission of these trace gases at the Earth's surface, the surface and/or atmospheric destruction of these gases, and/or their transport in the atmosphere. Proposals should be global or near-global in scope; proposals focused on limited geographical regions are of much less interest than those at larger spatial scales. Proposals that involve the comparison of model results with observations from regular measurement programs are particularly encouraged.

• The study of the dynamical, radiative, and chemical processes that couple the troposphere and the stratosphere, including those processes responsible for stratosphere-troposphere exchange. Proposals that address the transport of trace constituents across the tropopause, including the hemispheric, seasonal, and interannual variation in cross-tropopause fluxes are especially encouraged, as are proposals that address how the coupling between the troposphere and stratosphere might be expected to change in response to global atmospheric chemical change. Proposals that combine the use of atmospheric models with analysis of NASA-produced data sets are of particular interest.

SAGE II Science Team

The Stratospheric Aerosol and Gas Experiment (SAGE II) instrument is a seven-channel visible and near-infrared instrument which uses the technique of solar absorption at occultation to determine the vertical distribution of ozone, nitrogen dioxide, water vapor, and aerosols in the stratosphere and, in some cases, the upper troposphere. Since SAGE II

measures optical extinction, it also provides information on the presence of clouds, including both optically thick and optically thin clouds (including subvisible cirrus clouds).

SAGE II flies aboard the Earth Radiation Budget Satellite (ERBS), which was launched in October, 1984 and still takes data. ERBS flies in a 57 degree inclination orbit. A predecessor SAGE instrument, SAGE I, flew aboard the AEM-2 satellite and obtained data from 1979-1981. The SAGE instruments have played a critical role in determining the vertical distributions of ozone, aerosols, nitrogen dioxide, and water vapor in the stratosphere. SAGE data have been particularly important in characterizing long-term trends in stratospheric ozone and the evolution of the Earth's sulfate aerosol layer following the eruption of the Mt. Pinatubo volcano in June, 1991.

SAGE II data are made available through the Distributed Active Archive Center (DAAC) of the Earth Observing System Data and Information System (EOSDIS) at the Langley Research Center; prospective users may contact the SAGE II project scientist indicated in the main body of this announcement for information on data availability and formatting. A brief description of the relevant SAGE data products and key references follows:

• Ozone: SAGE ozone data are derived largely from atmospheric extinction measurements made by SAGE at 600 nm after correction for absorption from aerosols and other interfering gases based on use of extinction measurements at other wavelengths. Ozone measurements are obtained over a broad range of altitudes from the lower stratosphere up to the stratopause. SAGE data have been used for characterization of variability on several spatial and temporal scales, especially long-term trends (using SAGE II data only and both SAGE I and SAGE II data) [Wang et al., 1997]. The quality of the SAGE data has been verified through extensive comparison with other observations, including those from the Microwave Limb Sounder experiment on the Upper Atmosphere Research Satellite; these comparisons have shown the importance of having an adequate correction for the presence of large aerosol concentrations, such as those observed following the Mt. Pinatubo eruption [Cunnold et al., 1996].

• Stratospheric Aerosols: SAGE aerosol data are based on the inversion of extinction data at four wavelengths (0.385, 0.453, 0.525, and 1.02 mm), with vertical resolution of approximately 1 km. Long-term data sets for SAGE aerosol extinction have been developed, and conversion to surface area density has been carried out based on assumptions made about the nature of the aerosol size distribution. A multi-year climatology of SAGE-derived aerosol surface area distributions was presented by Thomason et al. [1997b]. Particular attention has been paid to the evolution of the high sulfate aerosol loading present in the stratosphere following the eruption of the Mt. Pinatubo volcano in June, 1991; data from SAGE and a variety of other data sources were combined to show the time-dependence of the variation of both aerosol number density and average particle size [Russell et al., 1996]. The possibility of long-term changes in background stratospheric aerosols over the time period 1979 (start of SAGE I observations) to 1989-1991 (pre-Pinatubo period studied with SAGE II observations) has also been considered [Thomason et al., 1997a].

• Water Vapor: SAGE water vapor data are based on the analysis of extinction data obtained by SAGE II at 0.94 mm. Vertical profiles may be obtained in cloud free regions down to approximately 6 km, with vertical resolution of 1 km being obtained. Water vapor data are available for the time period 1986-1991, with the window constrained by the need for low sulfate aerosol loading if accurate water vapor profiles are to be obtained. The seasonal and interannual variability of SAGE-derived water vapor distributions have been presented by Chiou et al. [1997]. SAGE water vapor data have also been used in a variety of process-

oriented studies, such as the study of deep convection on upper level moisture distributions [Liao and Rind, 1997].

•Nitrogen Dioxide: SAGE observations of nitrogen dioxide (NO_2) make primary use of extinction measurements in the 0.448 and 0.453 mm channel after correction for absorption from ozone, aerosols, and neutral density (which make use of data from other SAGE wavelengths) [Cunnold et al., 1991]. Since observations are made at sunrise and sunset, results should be interpreted in the context of the diurnal changes in NO_2 concentrations, including the slow interconversion between NO_2 and N_2O_5 over the course of the day, and the rapid interconversion of NO and NO_2 at sunrise and sunset. SAGE NO_2 data have been used in a variety of ways, including the demonstration of a strong manifestation of the quasi-biennial oscillation in its distribution [Zawodny and McCormick, 1992].

• Tropospheric Aerosols: SAGE observations of the vertical distribution of aerosols in the upper and middle troposphere have been made using the 0.525 and 1.02 mm channels. A significant component of the effort in deriving the upper tropospheric aerosol data is the separation of aerosol and cloud extinction in the SAGE data; the use of two significantly different wavelengths provides critical data for this separation. SAGE upper tropospheric aerosol data have been obtained for the period up till the eruption of Mt. Pinatubo; after that the high sulfate aerosol loading precluded the observation of the upper tropospheric aerosols. The meridional, seasonal, and interannual variability of the SAGE upper tropospheric aerosol product has been provided by Kent et al. [1995].

• Clouds: The occultation technique used by SAGE can be a very sensitive one for detecting clouds, as the long path length means that even thin clouds may provide enough extinction for SAGE to clearly see. SAGE has been shown to provide information on both opaque and subvisual clouds [Wang et al., 1996], and climatological distributions of different types of clouds have been determined. SAGE cloud observations have been compared with those from other data sets, including the International Satellite Cloud Climatology Project [Liao and Rind, 1995] and the High-Resolution Infrared Radiometer Sounder [Wylie and Wang, 1997].

• Temperature: Although the inversion of SAGE extinction observations to determine vertical profiles of ozone, aerosols, nitrogen dioxide, and water vapor normally uses externally supplied temperature profiles (typically from the US National Meteorological Center, now the National Center for Environmental Prediction), it has been shown that SAGE data can provide information on temperature in the middle and upper stratosphere (above approximately 30 km). This technique makes primary use of the 0.385 mm channel, in which ozone has no absorption, and aerosol and NO_2 effects can be removed using observations at other wavelengths and assumptions about aerosol size distributions and optical properties [Wang et al., 1992].

Proposals in several different areas are desired for the reconstituted SAGE Science Team:

• SAGE II Validation - Support would be provided for a limited number of measurements designed for comparison with SAGE II data. This would be for focused comparisons, and should **not** be used to support existing networks unless specific measurements are required for SAGE II validation. Data products of greatest interest for focused validation studies include SAGE II lower stratospheric ozone and water vapor, as well as lower stratospheric and upper tropospheric aerosol measurements. Other products for which validation is a lesser priority include nitrogen dioxide measurements and all middle and upper stratospheric measurements. The detailed comparison of SAGE and non-SAGE satellite data, including those from related instruments, such as the Halogen Occultation Experiment (HALOE), Polar Ozone Aerosol Monitor (POAM-2), and Stratospheric Aerosol Monitor

(SAM II) will also be considered in this category. **This is the only category of SAGE II Science Team activity for which support of field measurements will be considered.**

• SAGE Trend Studies - Support for analyses of long-term data sets on vertical profiles for SAGE observables, especially those of ozone and aerosols in the lower stratosphere, upper tropospheric aerosols, and upper stratospheric temperatures, including comparison with results appropriate ground- and balloon-based measurement networks (Umkehr, ozonesondes, lidar, etc.). Major foci in this area may include cross-instrument trend studies (including those for the SAGE I and SAGE II instruments), and examinations of interconsistency between measurements provided by various space- and ground-based instruments. Studies of the detailed relationships of instrument performance to retrieved ozone and aerosol distributions are important in this category.

• SAGE Algorithm Improvement - Support for studies of improvements to the retrieval algorithms used for the SAGE instruments will be provided. Proposals in this area should be very clear as to which SAGE observations are likely to be improved as a result of such studies, and should clearly reflect what the inadequacies are in the present product and algorithm.

• Tropospheric Aerosols - Support for analysis of the SAGE II upper tropospheric aerosol product, including comparisons of SAGE-derived information on aerosol abundance with that from surface-, airborne-, balloon-, and space-based information on aerosol distribution properties and photometric measurements is included here. Determination of climatologies and summaries of variability of upper tropospheric aerosol measurements are also included.

• Water Vapor - Support for studies of SAGE II water vapor data, including spatial and temporal variability, and comparisons with water vapor data from balloon-, aircraft-, and space-based measurements is considered here. Studies may make use of meteorological models for the interpretation of water vapor data, especially in the upper troposphere. Studies relating water vapor concentrations and SAGE-derived cloud distributions (see below) will also be considered.

• Nitrogen Dioxide - Support for studies of SAGE II nitrogen dioxide data, including variability on all spatial and temporal scales, and comparisons with data, especially that from relatively long-duration ground- and space-based measurements is considered here. Photochemical models may be used in these studies, especially to deal with the difference in local time between SAGE and other space-based measurements, and to provide a broader context for the processes that are responsible for nitrogen dioxide variability.

• Clouds - Support for studies of cloud distributions obtained from SAGE will be considered, including both optically thick and optically thin clouds (esp. subvisible cirrus). Comparisons of SAGE cloud statistics with those from other instruments and/or climatologies (especially the International Satellite Cloud Climatology Project, or ISCCP) are of particular interest.

• Atmospheric Transport - The use of SAGE data together with meteorological models to infer information about the processes which transport aerosols and trace gases within the stratosphere and between the troposphere and stratosphere is considered here. Studies that examine the role of naturally occurring interannual meteorological variability in affecting distributions of ozone, aerosols, and water vapor are of particular interest in this category.

Specific Instructions to Proposers

Although proposals from all interested members of the scientific community are desired, programmatic considerations and funding limitations place the following restrictions on proposals submitted in response to this NRA:

• The content of the proposal should provide sufficient detail to enable a reviewer to comprehend the nature of the proposed research and to assess its value, its relationship to the goals of ACMAP and/or the SAGE II Science Team, and the probability that the investigators will be able to accomplish the stated objectives within the requested resources.

• **The technical part of the proposal should be limited to the equivalent of 15 single-spaced typewritten pages, using type face which is a minimum of 12 point.** Additional pertinent information including publications, data, etc., may be added as attachments. Each proposal should contain the information indicated in Section (c) of Appendix B. Proposals should explicitly state on their cover sheets if the proposal is to be considered under ACMAP, the SAGE II Science Team, or both. **Note that proposals for correlative measurements and/or SAGE II validation can only be considered under the SAGE II Science Team since ACMAP does not support the obtaining of measurements.**

• Respondents having support from other NASA/Office of Earth Science (OES) programs, including other tasks within ACMAP, should include clear, concise statements of how their work proposed under this NRA complements and/or extends their current OES-funded work. This applies to research tasks for which the principal investigator or any co-investigator on this proposal is a principal investigator.

• If the proposed research is a renewal of an existing ACMAP or SAGE II Science Team task, a clear statement of the accomplishments of the investigators in their current research relative to the research plan outlined in the corresponding proposal should be included in a separate section. **This part should be limited to the equivalent of 5 single-spaced typewritten pages**, which are **in addition** to the 15 page limit described above. Reviewers will be asked to explicitly comment on this section of the proposal.

• All US investigators should include in each year the cost of one three day program review in the vicinity of Washington, DC in their budgets.

• Vitae should be included for each principal investigator and co-investigator associated with the proposal. In order to keep the size of proposals to a reasonable level, **no more than three pages** (including a summary of education, relevant experience, honors, awards, community service activities, and a listing of the most relevant publications) should be included for each principal or co-investigator.

• Included with this NRA as Appendix D are (1) Certifications, Disclosures, and Assurances Regarding Lobbying, Debarment & Suspension, and Drug-Free Workplace Requirements (2) cover sheet which should be completed and used with each proposal. One set of these completed forms must be included with the original signature version of all proposals.

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Appendix B

INSTRUCTIONS FOR RESPONDING TO NASA RESEARCH ANNOUNCEMENTS

(JANUARY 1997)

(a) General.

(1) Proposals received in response to a NASA Research Announcement (NRA) will be used only for evaluation purposes. NASA does not allow a proposal, the contents of which are not available without restriction from another source, or any unique ideas submitted in response to an NRA to be used as the basis of a solicitation or in negotiation with other organizations, nor is a pre-award synopsis published for individual proposals.

(2) A solicited proposal that results in a NASA award becomes part of the record of that transaction and may be available to the public on specific request; however, information or material that NASA and the awardee mutually agree to be of a privileged nature will be held in confidence to the extent permitted by law, including the Freedom of Information Act.

(3) NRAs contain programmatic information and certain requirements which apply only to proposals prepared in response to that particular announcement. These instructions contain the general proposal preparation information which applies to responses to all NRAs.

(4) A contract, grant, cooperative agreement, or other agreement may be used to accomplish an effort funded in response to an NRA. NASA will determine the appropriate instrument. Contracts resulting from NRAs are subject to the Federal Acquisition Regulation and the NASA FAR. Supplement. Any resultant grants or cooperative agreements will be awarded and administered in accordance with the NASA Grant and Cooperative Agreement Handbook (NPG 5800.1).

(5) NASA does not have mandatory forms or formats for responses to NRAs; however, it is requested that proposals conform to the guidelines in these instructions. NASA may acceptp proposals without discussion; hence, proposals should initially be as complete as possible and be submitted on the proposers' most favorable terms.

(6) To be considered for award, a submission must, at a minimum, present a specific project within the areas delineated by the NRA; contain sufficient technical and cost information to permit a meaningful evaluation; be signed by an official authorized to legally bind the submitting organization; not merely offer to perform standard services or to just provide computer facilities or services; and not significantly duplicate a more specific current or pending NASA solicitation.

(b) NRA-Specific Items. Several proposal submission items appear in the NRA itself: the unique NRA identifier; when to submit proposals; where to send proposals; number of copies required; and sources for more information. Items included in these instructions may be supplemented by the NRA.

(c) The following information is needed to permit consideration in an objective manner. NRAs will generally specify topics for which additional information or greater detail is

desirable. Each proposal copy shall contain all submitted material, including a copy of the transmittal letter if it contains substantive information.

(1) Transmittal Letter or Prefatory Material.

(i) The legal name and address of the organization and specific division or campus identification if part of a larger organization;

(ii) A brief, scientifically valid project title intelligible to a scientifically literate reader and suitable for use in the public press;

(iii) Type of organization: e.g., profit, nonprofit, educational, small business, minority, women-owned, etc.;

(iv) Name and telephone number of the principal investigator and business personnel who may be contacted during evaluation or negotiation;

(v) Identification of other organizations that are currently evaluating a proposal for the same efforts;

(vi) Identification of the NRA, by number and title, to which the proposal is responding;

(vii) Dollar amount requested, desired starting date, and duration of project;

(viii) Date of submission; and

(ix) Signature of a responsible official or authorized representative of the organization, or any other person authorized to legally bind the organization (unless the signature appears on the proposal itself).

(2) **Restriction on Use and Disclosure of Proposal Information**. Information contained in proposals is used for evaluation purposes only. Offerors or quoters should, in order to maximize protection of trade secrets or other information that is confidential or privileged, place the following notice on the title page of the proposal and specify the information subject to the notice by inserting an appropriate identification in the notice. In any event, information contained in proposals will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the notice.

Notice

Restriction on Use and Disclosure of Proposal Information

The information (data) contained in [insert page numbers or other identification] of this proposal constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed other than for evaluation purposes; provided, however, that in the event a contract (or other agreement) is awarded on the basis of this proposal the Government shall have the right to use and disclose this information (data) to the extent provided in the contract (or other agreement). This restriction does not limit the Government's right to use or disclose this information (data) if obtained from another source without restriction.

(3) **Abstract.** Include a concise (200-300 word if not otherwise specified in the NRA) abstract describing the objective and the method of approach.

(4) **Project Description**.

(i) The main body of the proposal shall be a detailed statement of the work to be undertaken and should include objectives and expected significance; relation to the present state of knowledge; and relation to previous work done on the project and to related work in progress elsewhere. The statement should outline the plan of work, including the broad design of experiments to be undertaken and a description of experimental methods and procedures. The project description should address the evaluation factors in these instructions and any specific factors in the NRA. Any substantial collaboration with individuals not referred to in the budget or use of consultants should be described. Subcontracting significant portions of a research project is discouraged.

(ii) When it is expected that the effort will require more than one year, the proposal should cover the complete project to the extent that it can be reasonably anticipated. Principal emphasis should be on the first year of work, and the description should distinguish clearly between the first year's work and work planned for subsequent years.

(5) **Management Approach**. For large or complex efforts involving interactions among numerous individuals or other organizations, plans for distribution of responsibilities and arrangements for ensuring a coordinated effort should be described.

(6) **Personnel**. The principal investigator is responsible for supervision of the work and participates in the conduct of the research regardless of whether or not compensated under the award. A short biographical sketch of the principal investigator, a list of principal publications and any exceptional qualifications should be included. Omit social security number and other personal items which do not merit consideration in evaluation of the proposal. Give similar biographical information on other senior professional personnel who will be directly associated with the project. Give the names and titles of any other scientists and technical personnel associated substantially with the project in an advisory capacity. Universities should list the approximate number of students or other assistants, together with information as to their level of academic attainment. Any special industry-university cooperative arrangements should be described.

(7) **Facilities and Equipment.**

(i) Describe available facilities and major items of equipment especially adapted or suited to the proposed project, and any additional major equipment that will be required. Identify any Government-owned facilities, industrial plant equipment, or special tooling that are proposed for use. Include evidence of its availability and the cognizant Government points of contact.

(ii) Before requesting a major item of capital equipment, the proposer should determine if sharing or loan of equipment already within the organization is a feasible alternative. Where such arrangements cannot be made, the proposal should so state. The need for items that typically can be used for research and non-research purposes should be explained.

(8) **Proposed Costs.**

(i) Proposals should contain cost and technical parts in one volume: do not use separate "confidential" salary pages. As applicable, include separate cost estimates for salaries and wages; fringe benefits; equipment; expendable materials and supplies; services; domestic and foreign travel; ADP expenses; publication or page charges; consultants; subcontracts; other miscellaneous identifiable direct costs; and indirect costs. List salaries and wages in appropriate organizational categories (e.g., principal investigator, other scientific and engineering professionals, graduate students, research assistants, and technicians and other non-professional personnel). Estimate all staffing data in terms of staff-months or fractions of full-time.

(ii) Explanatory notes should accompany the cost proposal to provide identification and estimated cost of major capital equipment items to be acquired; purpose and estimated number and lengths of trips planned; basis for indirect cost computation (including date of most recent negotiation and cognizant agency); and clarification of other items in the cost proposal that are not self-evident. List estimated expenses as yearly requirements by major work phases.

(iii) Allowable costs are governed by FAR Part 31 and the NASA FAR Supplement Part 1831 (and OMB Circulars A-21 for educational institutions and A-122 for nonprofit organizations).

(9) **Security**. Proposals should not contain security classified material. If the research requires access to or may generate security classified information, the submitter will be required to comply with Government security regulations.

(10) **Current Support**. For other current projects being conducted by the principal investigator, provide title of project, sponsoring agency, and ending date.

(11) **Special Matters.**

(i) Include any required statements of environmental impact of the research, human subject or animal care provisions, conflict of interest, or on such other topics as may be required by the nature of the effort and current statutes, executive orders, or other current Government-wide guidelines.

(ii) Proposers should include a brief description of the organization, its facilities, and previous work experience in the field of the proposal. Identify the cognizant Government audit agency, inspection agency, and administrative contracting officer, when applicable.

(d) **Renewal Proposals**

(1) Renewal proposals for existing awards will be considered in the same manner as proposals for new endeavors. A renewal proposal should not repeat all of the information that was in the original proposal. The renewal proposal should refer to its predecessor, update the parts that are no longer current, and indicate what elements of the research are expected to be covered during the period for which support is desired. A description of any significant findings since the most recent progress report should be included. The renewal proposal should treat, in reasonable detail, the plans for the next period, contain a cost estimate, and otherwise adhere to these instructions.

(2) NASA may renew an effort either through amendment of an existing contract or by a new award.

(e) **Length.** Unless otherwise specified in the NRA, effort should be made to keep proposals as brief as possible, concentrating on substantive material. Few proposals need exceed 15-20 pages. Necessary detailed information, such as reprints, should be included as attachments. A complete set of attachments is necessary for each copy of the proposal. As proposals are not returned, avoid use of "one-of-a-kind" attachments.

(f) **Joint Proposals**.

(1) Where multiple organizations are involved, the proposal may be submitted by only one of them. It should clearly describe the role to be played by the other organizations and indicate the legal and managerial arrangements contemplated. In other instances, simultaneous submission of related proposals from each organization might be appropriate, in which case parallel awards would be made.

(2) Where a project of a cooperative nature with NASA is contemplated, describe the contributions expected from any participating NASA investigator and agency facilities or equipment which may be required. The proposal must be confined only to that which the proposing organization can commit itself. "Joint" proposals which specify the internal arrangements NASA will actually make are not acceptable as a means of establishing an agency commitment.

(g) **Late Proposals**. A proposal or modification received after the date or dates specified in an NRA may be considered if doing so is in the best interests of the Government.

(h) **Withdrawal.** Proposals may be withdrawn by the proposer at any time before award. Offerors are requested to notify NASA if the proposal is funded by another organization or of other changed circumstances which dictate termination of evaluation.

(i) **Evaluation Factors**

(1) Unless otherwise specified in the NRA, the principal elements (of approximately equal weight) considered in evaluating a proposal are its relevance to NASA's objectives, intrinsic merit, and cost.

(2) Evaluation of a proposal's relevance to NASA's objectives includes the consideration of the potential contribution of the effort to NASA's mission.

(3) Evaluation of its intrinsic merit includes the consideration of the following factors of equal importance:

(i) Overall scientific or technical merit of the proposal or unique and innovative methods, approaches, or concepts demonstrated by the proposal.

(ii) Offeror's capabilities, related experience, facilities, techniques, or unique combinations of these which are integral factors for achieving the proposal objectives.

(iii) The qualifications, capabilities, and experience of the proposed principal investigator, team leader, or key personnel critical in achieving the proposal objectives.

(iv) Overall standing among similar proposals and/or evaluation against the state-of-the-art.

(4) Evaluation of the cost of a proposed effort may include the realism and reasonableness of the proposed cost and available funds.

(j) **Evaluation Techniques**. Selection decisions will be made following peer and/or scientific review of the proposals. Several evaluation techniques are regularly used within NASA. In all cases proposals are subject to scientific review by discipline specialists in the area of the proposal. Some proposals are reviewed entirely in-house, others are evaluated by a combination of in-house and selected external reviewers, while yet others are subject to the full external peer review technique (with due regard for conflict-of-interest and protection of proposal information), such as by mail or through assembled panels. The final decisions are made by a NASA selecting official. A proposal which is scientifically and programmatically meritorious, but not selected for award during its initial review, may be included in subsequent reviews unless the proposer requests otherwise.

(k) **Selection for Award**.

(1) When a proposal is not selected for award, the proposer will be notified. NASA will explain generally why the proposal was not selected. Proposers desiring additional information may contact the selecting official who will arrange a debriefing.

(2) When a proposal is selected for award, negotiation and award will be handled by the procurement office in the funding installation. The proposal is used as the basis for negotiation. The contracting officer may request certain business data and may forward a model award instrument and other information pertinent to negotiation.

(l) **Cancellation of NRA**. NASA reserves the right to make no awards under this NRA and to cancel this NRA. NASA assumes no liability for canceling the NRA or for anyone's failure to receive actual notice of cancellation.

APPENDIX C

GUIDELINES FOR FOREIGN PARTICIPATION

NASA accepts proposals from entities located outside the U.S. in response to this NRA. Proposals from non-U.S. entities should not include a cost plan. Non-U.S. proposals, and U.S. Proposals that include non-U.S. participation, must be endorsed by the respective government agency or funding/sponsoring institution in the country from which the non-U.S. participant is proposing. Such endorsement should indicate the following points: (1) The proposal merits careful consideration by NASA; and (2) If the proposal is selected, sufficient funds will be made available by the sponsoring foreign agency to undertake the activity as proposed.

Proposals, along with the requested number of copies and Letter of Endorsement must be forwarded to NASA in time to arrive before the deadline established for this NRA. In addition, one copy of each of these documents should be sent to:

NASA Headquarters
Office of External Relations
Earth Science Division, Code IY
Washington, DC 20546
USA

Any materials sent by courier or express mail should include the street address 300 E Street, S. W., and substitute 20024 for the indicated ZIP code.

All proposals must be typewritten in English. All non-U.S. proposals will undergo the same evaluation and selection process as those originating in the U.S. Non-U.S. proposals and U. S. Proposals that include non-U.S. participation, must follow all other guidelines and requirements described in this NRA. Sponsoring non-U.S. agencies may, in exceptional situations, forward a proposal without endorsement to the above address, if review and endorsement are not possible before the announced closing date. In such cases, however, NASA's Earth Science Division of the Office of External Relations should be advised when a decision on the endorsement is to be expected.

Successful and unsuccessful proposers will be contacted directly by the NASA Program Office coordinating the NRA. Copies of these letters will be sent to the sponsoring government agency.

Appendix D

Proposal Cover Sheet
NASA Research Announcement 98-OES-04

Proposal No. _____ (Leave Blank for NASA Use)

Title: _____

Principal Investigator:

Name: _____

Department:_____

Institution: _____

Street/PO Box: _____

City: _____ State: _____ Zip: _____

Country: _____ E-mail: _____

Telephone: _____ Fax: _____

Co-Investigators:

Name	Institution	Telephone
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Budget:

1st Year: _____ 2nd Year: _____ 3rd Year: _____ Total: _____

Type of Proposal:

Atmospheric Chemistry Modeling and Analysis Program Proposal _____

Stratospheric Aerosol and Gas Experiment (SAGE II) Science Team Proposal _____

Consideration Requested in Both Programs _____

Authorizing Official: _____ _____
(Name) (Institution)